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$$\frac{x^2}{(1-x)^3}y = \frac{C+1}{9(1-x)^3} - \frac{1}{2(1-x)^2} + \frac{1}{(1-x)} + \log K.\sqrt[3]{(1-x)}.$$

Solved similarly by C. A. ISAACS, GERTRUDE MCCAIN, and H. L. OLSON.

2793 [1919, 458]. Proposed by J. L. RILEY, Stephenville, Texas.

If a, b, and c, are complex, and α, β, and γ, real constants, the point

$$x = \frac{at^2 + 2bt + c}{\alpha t^2 + 2\beta t + \gamma}$$

traces a conic or a straight line when t takes all real values.

DISCUSSION BY A. F. FRUMVELLER, Marquette University.

Since x is a complex number, let us put $x = u + iv$, $a = a_0 + a_1 i$, $b = b_0 + b_1 i$, $c = c_0 + c_1 i$, and clear of fractions. Separating the real and imaginary parts of this equation, we obtain the simultaneous set

$$(1) \qquad \begin{cases} t^2(\alpha u - a_0) + 2t(\beta u - b_0) + (\gamma u - c_0) = 0, \\ t^2(\alpha v - a_1) + 2t(\beta v - b_1) + (\gamma v - c_1) = 0. \end{cases}$$

The eliminant is $|p_0q_1| \cdot |p_1q_2| - |p_0q_2|^2 = 0$ (L. E. Dickson, *Elementary Theory of Equations*, New York, 1914, p. 155), where

$$|p_0q_1| = 2\begin{vmatrix} \alpha u - a_0 & \beta u - b_0 \\ \alpha v - a_1 & \beta v - b_1 \end{vmatrix}$$

$= 2\,[(\alpha b_0 - a_0\beta)v + (a_1\beta - \alpha b_1)u + (a_0b_1 - a_1b_0)]$ with similar expressions for the other two determinants.

The eliminant is, therefore, a quadratic in (u, v), *i.e.*, a conic, which under suitable conditions degenerates into straight lines. This conic in the plane uov (the plane of the complex number x) is in reality the projection of the actual path of the moving point in space as it spirals its way around the axis of t or a parallel line standing out at right angles to the lines $\overline{ou}$, $\overline{ov}$, in the x-plane.

Cf. an article on "The graph of $f(x)$ for complex numbers" (this MONTHLY, *1917*, 409), where many analogous examples are worked out and graphed in this rather unusual system of coördinates.

Also solved by ARTHUR PELLETIER.

2796 [1919, 458]. Proposed by N. P. PANDYA, Amreli, India.

Construct a triangle ABC having its centroid on a given ellipse, AB being a fixed diameter of the ellipse and C lying on one of the directrices.

SOLUTION BY GRACE M. BAREIS, Ohio State University.

Let O be the center of the given ellipse. Construct OM perpendicular to a directrix and meeting it at M. Determine P on OM so that $OP = \frac{1}{3}OM$. Through P draw a line parallel to the directrix and cutting the ellipse in N_1 and N_2. Draw ON_1 and ON_2 meeting the directrix in C_1 and C_2, respectively. Then ABC_1 or ABC_2 is a solution. It is to be noted that the points C_1 and C_2 are fixed points whatever diameter AB may have been chosen. The problem has four solutions, two corresponding to each directrix, if $e > \frac{1}{3}$; two solutions, one corresponding to each directrix, if $e = \frac{1}{3}$; no real solution when $e < \frac{1}{3}$.

Also solved by E. J. OGLESBY, H. L. OLSON, and ARTHUR PELLETIER.

2797 [1919, 458]. Proposed by E. J. OGLESBY, New York University.

Solve for x and y, the simultaneous equations,

$$x^3 + y^3 = 35 \qquad \text{and} \qquad x^2 + y^2 = 13.$$

Solution by H. N. Carleton, West Newbury, Mass.

Let $x = u + v$ and $y = u - v$. Substituting these values of x and y in the original equations, we have after reducing

$$2u^3 + 6uv^2 = 35 \cdots \tag{1}$$

and

$$2u^2 + 2v^2 = 13 \cdots . \tag{2}$$

Equating the values of v^2 from (1) and (2) we have

$$4u^3 - 39u + 35 = 0, \qquad \text{or} \qquad (u - \tfrac{5}{2})(4u^2 + 10u - 14) = 0.$$

Whence, $u = 5/2, 1$, or $-7/2$. Hence, corresponding values of v are $\frac{1}{2}$, $\frac{1}{2}\sqrt{22}$, and $\frac{1}{2}\sqrt{-23}$, respectively. Hence, $x = u + v = 3$, $1 + \frac{1}{2}\sqrt{22}$, or $-7/2 + \frac{1}{2}\sqrt{-23}$ and the corresponding values of y are $u - v = 2$, $1 - \frac{1}{2}\sqrt{22}$, and $-\frac{7}{2} - \frac{1}{2}\sqrt{-23}$, respectively. By virtue of the symmetry of the equations, the corresponding values of x and y may be interchanged, thus making a total of six solutions.

Also solved by H. L. Agard, Norman Anning, Grace M. Bareis, H. C. Bradley, S. M. Berg, John Biggerstaff, G. A. Bingley, W. E. Cleland, H. J. Ettlinger, C. H. Grove, Olive C. Hazlett, Alex. Knisely, C. N. Mills, J. Q. McNatt, A. R. Nauer, H. L. Olson, R. H. Reece, J. L. Riley, Emeterio Roa, M. M. Smith, H. S. Uhler, W. W. Warner, E. E. Whitford, and C. N. Wunder.

NOTES AND NEWS.

It is hoped that readers of the MONTHLY will cooperate in contributing to the genera interest of this department by sending items to the Editor-in-Chief.

Professor J. K. Lamond, of Pennsylvania College, Gettysburg, has resigned to accept a position in the engineering department of the Bell Telephone Company at Philadelphia.

Dr. C. L. E. Wolfe, of the Junior College at Santa Rosa, has been appointed instructor in mathematics at the California Institute of Technology, Pasadena.

On page 187 of *Scientific Monthly*, February, 1921, there is a full-page portrait of Professor E. H. Moore, of the University of Chicago, president of the American Association for the Advancement of Science.

At the close of the present academic year Dr. P. H. Hanus, professor of the history and art of teaching at Harvard University since 1901, will retire from active service. He was born in Silesia and came to the United States when he was four years old. He taught mathematics and science in a high school of Denver, Col. 1878–79, was professor of mathematics in the University of Colorado 1879–86 and was principal of another Denver high school 1886–90. His connection with Harvard dates from 1891. His first book, *An Elementary Treatise on the Theory of Determinants*, was published in 1886. There have been several reprints of his *Geometry in the Grammar School; an essay together with illustrative class exercises, and an outline of the work for the last three years of the grammar school* (4 + 52 pages, 1893).